

Claims

*Sub A*

1. Apparatus for detecting charged particles, the apparatus comprising a chamber for receiving said particles and being such that, in use, at least a partial vacuum is maintained in the chamber; an impact responsive sensor for detecting particles incident thereon, at least the part of the sensor on which the particles are incident being situated in the chamber; accelerating electrode for providing, in the chamber, an electric field for accelerating charged particles therein towards the sensor and an electrically conductive barrier sealing the chamber in such a way as to prevent the passage of gas into the chamber, to allow said at least partial vacuum to be maintained, the barrier being sufficiently thin to enable the charged particles to be detected to travel therethrough, and being electrically isolated from the accelerating electrode so as to be capable of being maintained at a different potential from the latter.
2. Apparatus according to claim 1, in which the accelerating electrode is situated on or adjacent the sensor, and a connector for connecting said member to an accelerating voltage.
3. Apparatus according to claim 1, in which the sensor comprises a scintillator for emitting light in response to the impact of a charged particle therewith.
4. Apparatus according to claim 3, in which the scintillator incorporates said accelerating electrode.
5. Apparatus according to claim 4, in which the sensor comprises an Everhard-Thornley detector.
6. Apparatus according to any of the preceding claims, in which the barrier conveniently comprises a membrane of metallic foil.
7. Apparatus according to claim 6, in which the foil is of aluminium.

*Sub B*

8. Apparatus according to claim 7, in which the aluminium foil is of a thickness of 7.5nm.

9. Apparatus according to claim 6, in which the barrier means further comprises support means which extends across said inlet behind the foil to support the latter against pressure exerted on the membrane by gas outside the chamber.

10. Apparatus according to claim 1, in which the apparatus further includes an electrically conductive cage mounted in front of, but electrically insulated from, the barrier means, the cage being connectable to an accelerating voltage for drawing particles towards the barrier means, the cage being so constructed as to allow the passage of particles therethrough.

11. Apparatus according to claim 1, in which the apparatus includes a pump connected to, and operable to evacuate, the chamber.

12. Apparatus according to claim 2, in which the apparatus includes voltage source for applying a first accelerating voltage to said electrically conductive member and a second accelerating voltage of the same polarity as, but lower than, the first accelerating voltage, to the barrier.

13. Apparatus according to claim 12, in which the voltage source is also operable to apply to the cage a further voltage, of the same polarity as, but lower than, the second voltage.

14. Apparatus according to claim 10, in which the cage is part-spherical or ellipsoidal.

15. A scanning electron microscope having a sample chamber for holding a sample to be imaged in a gaseous environment, generating means for generating a scanning beam of electrons and directing said beam onto a sample in said sample chamber, wherein said chamber also contains detecting means for detecting secondary electrons emitted by the sample, said detecting means comprising apparatus according to claim 1.

*See B*

16. A microscope according to claim 15, in which the electrically conductive member and barrier are connected to a voltage source for applying a voltage of +10 kV to the member and of 0 to +1 kV to the barrier.